$2.00 US

The Amateur Radio

COMMUNICATOR

June/July 1991 Volume 1 Number 3

- History of Radio Regulation: Part 1
- The Half-Wavelength Dipole
- Using Live Equipment in the Classroom
- Electronic Adventures of Dan and Burke

Cellular Fone Fighter

Personal communications without the monthly bill.

By Don Stoner, W6TNS

I couldn't believe it! In order to buy a cellular phone, I had to sign up for a year of service—good or bad. I also had to pay a minimum charge each month, even if I didn't make a single call. And, if I did use it—their electronic cash register gobbled up 40 cents a minute!!

THEN SANITY PREVAILED

My ever practical wife doused me with a bucketful of reality. "Why do you need a cellular phone? You've got a ham license," she reasoned. "At those prices you could pay for a handheld two-way radio in a few months."

She was right—as usual. I wanted the phone to keep in touch with the family and friends. A phone in the car would save a lot of grief in an emergency. My bride reminded me that ham radio could provide all this and a lot more, so long as I didn't use it for business (that's not permitted in the Amateur Radio Service). Most important, the price was right—it was free!

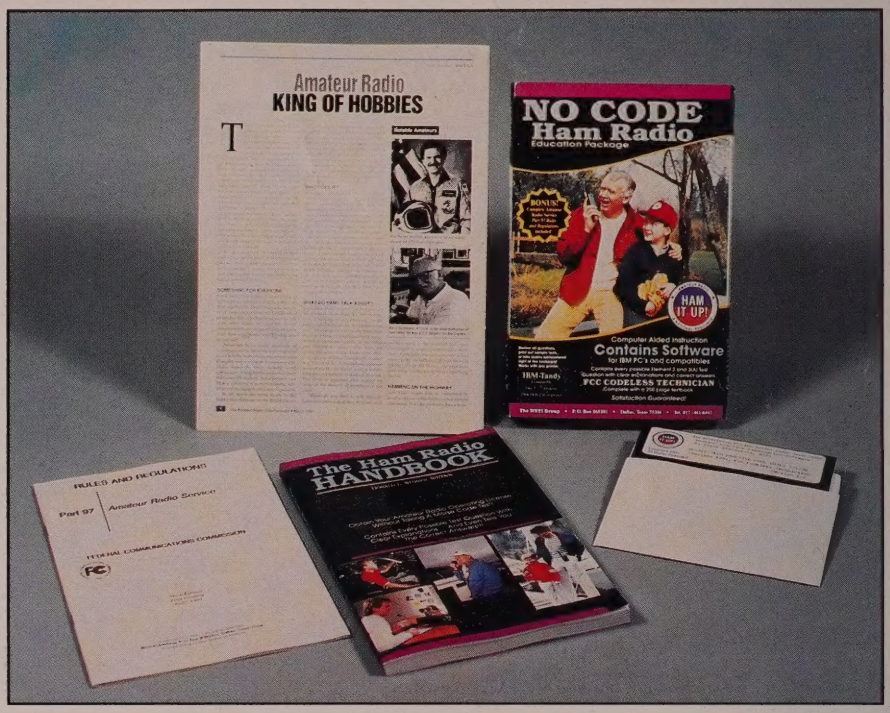
Don't confuse ham radio with CB—there's a world of difference! Amateurs use FM two-way radios for static-free, one conversation at a time, communication. When transmitting via mountaintop repeaters, hams communicate over ranges of a hundred miles or more using tiny radios that fit in a purse or pocket.

WANT TO MAKE NEW FRIENDS?

If so, ham radio is for you. Anyone can be a ham radio operator. There's no age restriction or nationality requirement. Other Amateurs don't care who you are or what you look like—you are just one of the many people that "hang out" on the ham bands. Amateur Radio is a great diversion for young people who need a new direction in their life.

Are you a boater? No matter where your vessel is located, you can contact an Amateur by radio. With a ham "rig" connected to your backstay, you are never out of radio contact with someone, somewhere in the world.

Ham radio is the most ideal hobby ever "invented" for retired persons. There is always someone to talk with at any hour of the day or night. With an FM two-way radio, you can have static-free contact with other hams virtually anywhere you travel in the U.S.



TOO GOOD TO BE TRUE?

Sure, there's a catch. To operate a ham station, you need a license issued by the Federal Communications Commission. However, the FCC has eliminated the Morse code requirement for newcomers. You don't need to know a dot from a dash! To earn a license, all you have to do is pass a multiple choice written test. It's almost as easy as getting a drivers license—and there's no "driving test."

I've made getting a ham license even easier with a new book called ***The Ham Radio Handbook***. The book includes every question you might be asked on the written test and all the possible answers for each multiple choice question. My book also tells you which answer is correct along with some simplified theory to explain why the answer is correct.

THE DON STONER GUARANTEE

If you can earn a ham license at all, you can do it after reading my book. I'm so sure, I'll make this guarantee: If you fail your license exam after reading ***The Ham Radio Handbook***, just return everything in salable condition and I'll refund the full purchase price—including postage (proof of purchase required). You can pass the ham test and I guarantee it!!

Take advantage of my bonus education package. I'll send the book, plus IBM compatible software for testing your knowledge. It will tell you when you are ready to take your test. The program displays randomly selected questions, lets you pick the correct answer and grades your performance. Or, if you prefer, you can print out the tests. The package includes a complete list of Contact Volunteer Examiners. They can tell you where and when to take your test no matter where you live. The package contains a bonus booklet which provides all the FCC Rules and Regulations on ham radio. Another bonus is the certificate for a free copy of *The Amateur Radio Communicator,* the journal of the National Amateur Radio Association.

All this is yours if you place a free call to the National Amateur Radio Association at 1-800-468-2426. Have your VISA or MasterCard ready. Tell the operator you want the NARA Amateur Radio Educational package for $29.95 ($3.00 S&H) to any U.S. address. Or, if you just want the book, your cost is only $9.95 ($2.00 S&H) if you mention seeing this advertisement. If you prefer to send a check, write the National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond, WA 98052.

Ham radio is guaranteed to influence your life and future positively.

DO IT TODAY!!

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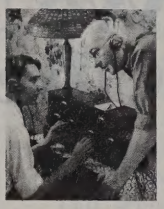

Before the First World War, there was a young dreamer named David Sarnoff who had an idea. In 1916 he put his thoughts in a letter addressed to Edward J. Nally of the Marconi Company.

"I have in mind," Mr. Sarnoff wrote,

(Continued on page 4)

The Amateur Radio Communicator

The Amateur Radio Communicator is published monthly and is the official journal of the National Amateur Radio Association (NARA), 16541 Redmond Way, Suite 232, Redmond, WA 98052.

The National Amateur Radio Association is incorporated in the State of Washington and is an exempt organization as defined in Section 501(c)(3) of the Internal Revenue Service Code.

Organization Goals

The National Amateur Radio Association is a nonprofit organization. It consists of individuals interested in the art of radio communication. The broad goal of NARA is to make Amateur Radio more widely known and to encourage more people to become involved in the Amateur Radio Service.

The organization has four specific goals within this broad framework. These are to a) publicize Amateur Radio to the general public, b) attract young people to the Amateur Radio Service, c) help existing Amateurs achieve the greatest benefit from the Amateur Radio Service and d) make Amateurs aware that our radio frequencies are in jeopardy from commercial interests.

NARA advertises in various consumer publications to create a public awareness of the Amateur Radio Service and to encourage readers to write NARA for more information. The Association also solicits authors who write on the subject of Amateur Radio in these publications. NARA has committed itself to making Amateur Radio more interesting and more accessible to all concerned.

NARA is specifically interested in encouraging young people to join our fraternity. The organization works with educators to increase awareness of the Amateur Radio Service and its value as an interesting way of educating young people. A core of young people insures continued growth of the Amateur Radio Service.

NARA believes that existing Amateurs should be more aware of the radio communication theory. Each month an article will appear in *The Amateur Radio Communicator* which discusses a technical aspect of the Amateur Radio Service.

NARA is very concerned that confiscation of frequencies assigned to the Amateur Radio Service will continue. These frequencies are a precious resource. On the other hand, there are an inadequate number of frequencies to accommodate all the new communication requirements. Amateurs must create an environment where it is more beneficial to the public to have Amateur Radio operators on these frequencies than new and emerging commercial services.

Membership and Subscriptions

Those joining NARA receive a subscription to *The Amateur Radio Communicator* for a period of one year. The combined cost of membership and magazine is $10.00 per year in all areas with a U.S. ZIP code. The cost is $16.00 per year in Canada and $20.00 per year elsewhere.

The NARA membership and subscription to *The Amateur Radio Communicator* cannot be separated. Since NARA is a nonprofit corporation, the membership cost may be tax deductible. Verify this with your accountant.

It is not necessary to hold an Amateur Radio license to become a member of the National Amateur Radio Association. The only "qualification" is an interest in radio communications.

Editorial Policy

Each article and column which appears in *The Amateur Radio Communicator* is evaluated by the Editorial Board to meet a single criteria: how it contributes to NARA's educational objectives. Editorial material is intended to either (1) interest new people in becoming a Radio Amateur, (2) help existing Radio Amateurs get more out of their hobby through better understanding, (3) explain the theory behind some aspect of the service or (4) educate Amateurs on how to retain our valuable spectrum.

How To Contact NARA

The editors of *The Amateur Radio Communicator* and officers of the National Amateur Radio Association want to hear from you. Please send your questions, comments or submissions to the National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond, WA 98052 or call 1-800-468-2426 or 206-232-2579. To reach us via electronic mail, our MCI Mailbox is NARANET3 and on CompuServe it is 76702,753.

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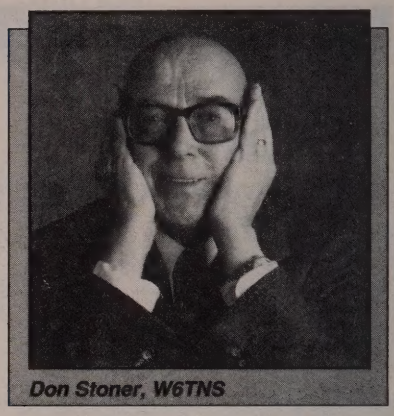
We Must Stop Cheating Our Children

PART 1



Don Stoner, W6TNS

BY DON STONER, W6TNS

Sometime in the past few decades a wonderful treasure disappeared from the American scene. Recently, I was going through some of my father's (K6HX) possessions that had been put away when he became a "silent key." I ran across his old Pickett slide rule. Memories of him sweating over his First Class Radiotelephone license exam rushed through my head.

For those of you who have never seen a slide rule, permit me to draw on the blackboard in your mind. It was about 12 inches long, like a ruler. The better (to the purist) slide rules were ivory-covered bamboo, while the cheap ones were molded plastic. In the center of the rule, was a second wooden sliding piece that could be moved in either direction. There were various numbers, graduations, and strange incantations printed on both pieces. A sliding plastic cursor, with a finely engraved line, could be slid back and forth along the entire length of the rule. By lining up the numbers to be manipulated, a mathematical answer of reasonable accuracy could be determined. It was great for trigonometry, algebra, logarithms, and the like, particularly since computers for the common folk hadn't yet been invented.

I showed Dad's rule to some of my young friends and explained how one solved mathematical problems before our homes and offices became flooded with "impersonal computers." Most of the young people who examined it had never seen or heard of one before. They were quite amused when I confessed that, with reasonable care, one could get an answer to two decimal places.

The "slip stick" did not disappear overnight. It faded from the scene so slowly that it was hardly missed. In my opinion, the demise of the slide rule brings to mind the loss of another American treasure—the ability to educate our children. Students interested in science and technology are as rare as the slide rule.

"Science and technology is not just a body of knowledge."

During the days of the stone axe, superior technology gave the cave dwellers an advantage over their neighbors. Technology was also a decisive factor when the Hittites clobbered the Egyptians. The Hittites' high-tech, cast-iron swords outperformed the Egyptians' soft bronze swords. Even today, superior technology plays an important role. While it may not guarantee success in a conflict situation, it sure helps when someone points a Scud missile in your direction.

Science and technology is not just a body of knowledge. It's not a place or a thing. Rather, science and technology is a state of mind; a way of thinking. Minds designed the missile that hugged the terrain for hundreds of miles, zipped around hotels, and then thundered into an airplane bunker. The brainpower of a thousand "nerds" contributed to the design of laser-guided weapons that equaled the precision bombing in the futuristic movie *Star Wars*.

Considering the sorry state of our educational system, it is a wonder the situation was not reversed in the Gulf War. Only the fact that Iraqi schools are worse than ours saved the day.

Remember Sputnik? When the Soviets orbited the first space vehicle, Americans asked how a "backward" nation like the Soviet Union could accomplish this feat ahead of the most advanced and powerful nation on earth. Only a small amount of introspection was required to realize that our educational system was at fault.

Every 96 minutes of each day and night, we were reminded that the good ol' U.S. of A. was second best in the race for space. It was enough to jolt the nation awake from our long sleep. Suddenly, astronauts were more admired than baseball players. In the succeeding years, science and technology underwent a renaissance in our schools and industries. As a result we were able to put men on the moon and create affordable computers with tiny plastic disks that hold many hundred million pieces of information. This was the golden age for science and technology in American schools.

Then, academia leaned back, viewed their handiwork with smug pleasure, and promptly went back to sleep. They had done their job. We beat the Soviets at their own game. Now it was time for our educational

system to rest and reflect upon their greatness. Someone decided that since all people were created equal, they were all entitled to the same poor education. It became more important to teach politically correct thoughts than how to calculate the diameter of a circle. Today we emphasize sports while the Japanese emphasize science. Today's students idolize the salaries of lawyers, brokers, and sports figures just as Soviet students idolize and respect Yuri Gagarin.

We do not seem to have learned anything from the experience. America is not even in second place anymore. During recent worldwide comparative testing of high school students, the United States came in 17th out of a field of 20.

Think I'm exaggerating? The United States ranks almost dead last in math. On a standardized Algebra test, American students only answered an average of 43 percent of the questions correctly. Their Japanese counterparts averaged 78 percent on the same test. On a standardized Chemistry test only 2 of 13 nations did worse than the United States. Students in Britain, Singapore, and Hong Kong were light-years ahead of us. If nothing is done to change the educational morass, 70 million Americans will be functionally illiterate by the end of this decade.

You've all heard the statement that in order to "get ahead" today, one must have a college education. It's true, but did you ever wonder why? Under our current educational system, possession of a high school diploma means nothing more than that the student was breathing on graduation day. To a potential employer, it conveys absolutely no indication of the person's academic ability. It doesn't even guarantee a job at Mcdonald's. Graduates have no concept of how corporations function, the ethics of property ownership, who are their congressional representatives or how to contact them and make their wishes known. Ask your kids who Yuri Gagarin is and why he is famous. Do you know?

Once again there is panic as we realize the Japanese graduate 100 engineers for every lawyer. In the United States the numbers are reversed. With a smaller population than this country, Japan produces twice as many engineers and has four times as many Amateurs. In general scientific knowledge, American students rank below most of the impoverished countries of Eastern Europe. Of the doctorates granted in physics last year, more than half went to foreign nationals. Most plan to return home with their newly-acquired knowledge. Every year, more patents are granted to foreign companies than to American enterprises. The number of undergraduates with science majors has dropped in half since 1960.

Where does the fault lie? With the parents, teachers, and counselors of the '60s and '70s. It was you who told the students (overtly and covertly) that science was neither fun nor profitable. Get an MBA, learn marketing, or express yourself in the arts, you said. Be a lawyer, you counseled, to insure the payments on your BMW. Physics, chemistry, and mathematics were not attractive or lucrative, you told vocationally-oriented students. Parents didn't demand the classroom discipline necessary to create a good scientist. As a result, we live in the most technologically advanced society in history yet we have virtually no technical knowledge. Most adult Americans cannot even perform the simple technical task of programming the VCR to record the "soaps" while the family is on vacation.

"On a standardized chemistry test only 2 of 13 nations did worse than the United States."

Basically, the sciences have fallen through the academic cracks and we, as a nation, are in trouble as a result. Money can be used to patch up some problems; build new facilities, purchase new equipment, and provide better pay for teachers. These are Band-Aid solutions. It is going to take a radical change in the attitude of the public, the academic community and society as a whole to fix this mess. Engineering must be viewed as an attractive career once again.

Our schools and colleges must again convince students that the pursuit of science is a noble one, just as generations had believed since the Renaissance. Academic literature must stress the fascination of scientific method and experimentation. We must adopt the discipline necessary to solve complex equations and theories or a lengthy experiment. Science is not just a convenient route to enter medical school but rather, an end in itself. It is a discipline well worth pursuing, as are engineering and communications.

What does all this have to do with ham radio? At the National Amateur Radio Association, we believe that Amateur Radio can be used to light a spark in the eyes of young people throughout the nation. The vision thus created can look beyond narrow horizons. Teachers can and should use ham radio to introduce their students to the fascinating world of science and technology.

So please bear with me in coming months, fellow hams and "wannabe's." What we are doing to our kids borders on criminal negligence and I have some opinions on what should be done to correct the morass in which our educational system wallows. If you feel as I do, follow along and let's see if we can make a difference. Someone must.

73 DE Don, W6TNS ❑

CORRECTION

The address for Fred Maia, W5YI, was listed incorrectly in the April/May issue. The correct address is: Fred Maia, W5YI, National Volunteer Examiner Coordinator, P.O.Box 565101, Dallas, Texas 75356. We apologize for any problems this may have caused.

LETTERS

WE'LL HELP

Thanks for the copy of the *Communicator*. Yes, I sure will give you a hand. We hams have had our head in the sand for far too long. Thanks to guys like you, W5YI, W2NSD and a few others, we may save our hobby yet.

My daughter, KA9SZU, and I will help by giving tests or teach those who will take the time to contact us for appointments. My phone number here is (417) 833-6056. When in South Bend, IN, it is (219) 291-6280 at the home of Nellie Yoder, N9KAP.

Set me up for three years, check enclosed for $25.00. More power to you and those who will help you.
J. Harold Gibson, W9PQO
RR2, Box 329
Fair Grove, MO, 65648

❑ *Thanks, Harold, for your encouragement and support. If there were more hams like you, the Amateur Radio Service would be in great shape!—Ed.*

I PASSED THE TEST!

Please sign me up for one year membership in the NARA, my $10 is enclosed. I used your new ham radio book for the Tech test and passed it after two weeks of study.
Thanks,
Don Koelker, Sr. (no call yet)

❑ *That's really great, Don, and thanks for the testimonial. The first printing sold out in less than 60 days! Something is going on out there!—Ed.*

HAM CLASSES IN LOS ANGELES

We're conducting classes in Southern Los Angeles. Students may enroll in the class at any time, and take the Novice test when they feel qualified to do so. There is no charge for the class. Textbooks are available for $1.50 and code tapes are loaned with a $3.00 deposit which is refunded when the tapes are returned. Novice tests are given free of charge. All classes and tests are given at the Los Angeles Maritime Museum, Berth 84, San Pedro, CA. Phone Elvin Lytle, N6DYZ at (213) 325-2965 for information on dates and times.

❑ *Fantastic!! I wish more clubs offered this sort of program. We at NARA know where to send people to take their tests, but our database on who teaches classes is very small. Let us know who is doing what and we'll make good use of the information.—Ed.*

HAM AND SCOUTING

Have any of your readers combined Amateur Radio operation with Boy Scout and/or Explorer activities, such as High Adventure Trips, Emergency Preparedness Events, Controlled Klondike Derbies, operated Jamboree-on-the-Air Stations, etc.? If so, please share your experiences with others by sending your information and photos about communications events and Ham Radio Explorer Post Program Management. The data will be used in a future Scouting and Explorer Ham Radio Manual. You will be given credit for your ideas and suggestions.
73,
Hal Camlin, W3QLP
Advisor of Explorer Post 73
Baltimore Area Council, BSA
7506 Jacqwill Rd.
Glen Burnie, MD 21061-3812

❑ *Good luck on your project, Hal. There is a lot of information out there if folks will send it to you.—Ed.*

The Editor would like to hear from you! Send your questions or comments for the Editor to:
National Amateur Radio Association
16541 Redmond Way, Suite 232
Redmond, WA 98052
You can also use:
MCI Mail (NARANET3)
or
CompuServe (76702,753).

THE COVER

David Sarnoff

(Continued from page 1)

"a plan which would make radio a 'household utility' in the same sense as the piano or phonograph. The idea is to bring music into the house by wireless.

"It would seem to be entirely feasible. For example, a radio telephone transmitter having a range of say 25 to 50 miles can be installed at a fixed point where instrumental or vocal music, or both, are produced. The receiver can be designed in the form of a simple 'Radio Music Box' and arranged for several different wave lengths, which should be changeable with the throwing of a single switch or pressing of a single button.

"The same principal can be extended to numerous other fields; for example, receiving lectures at home, and also events of national importance. Baseball scores can be transmitted by the use of one set installed at the Polo Grounds."

For those of you not familiar with the name, David Sarnoff made his dream come true for millions. He was the first president of the Radio Corporation of America (RCA). ❑

THIS IS YOUR LAST WARNING!!

Don't say we didn't ***warn*** you! This growing and progressive organization mails 20,000 complimentary copies of *The Amateur Radio Communicator* each month. But if you can't afford 10 bucks to join NARA, support your hobby and increase your knowledge—*then Stoner says to cut you off!*

But you can avoid the pain and embarrassment of rejection and insure a continuous flow of information by joining NARA today. We know that a person with your intelligence and panache wants to support our hobby and help NARA "spread the word" about the advantages of being an Amateur Radio operator. Don't get mad, get even!

Make us reenter your name and address in our computer right now. Turn to the back cover and fill out the membership form.

DO IT TODAY AND FEEL GOOD ABOUT YOURSELF AND YOUR HOBBY ONCE AGAIN!

The Simple Half-Wavelength Dipole Antenna

Welcome Aboard!

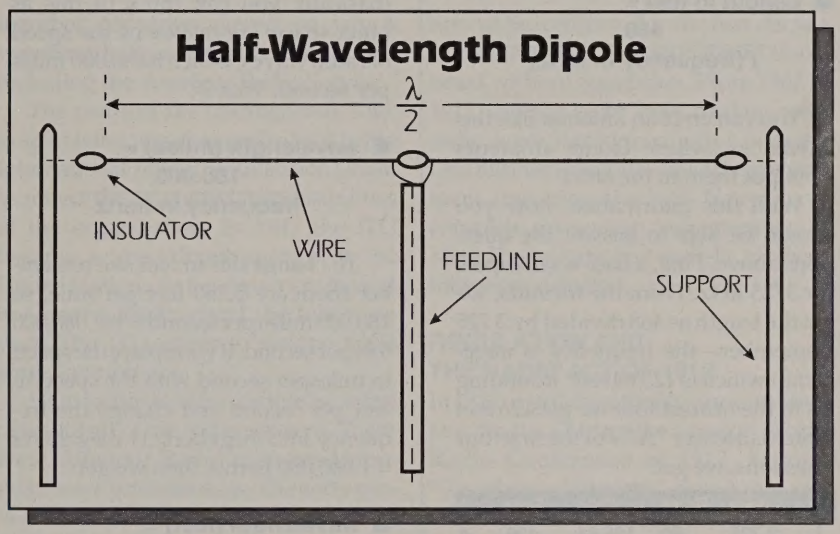
BY TERRY R. DETTMANN, WX7S

One of the major objectives of the National Amateur Radio Association is not only to help people *become* Amateur Radio Operators, but to help them become *better* operators. To do this, we need to become more knowledgeable operators. This column is about expanding our understanding of cncepts Amateur Radio Operators need to know.

In the coming months, we'll be going over topics of interest to Amateur Radio Operators and future Amateur Radio Operators. We'll talk about technical topics, operating topics, and everything you *should* know to be a good Amateur. To do that, we'll focus in on some of the questions asked in Amateur Radio examinations and discuss them in greater detail. While the emphasis will be on explaining concepts for new Amateurs and people who want to *be* Amateurs, we won't limit ourselves to questions from any single exam, but rather look at *all* questions which could be asked on *any* examination. If you have any questions that are bothering you, please write. See page 6 for my mailing address.

LET'S BEGIN WITH ANTENNAS

Our starting point is antennas, and we'll start with the Novice examination and the questions about one of the simplest of all Amateur antennas—the half-wavelength dipole. The Novice examination has five questions about the half-wavelength dipole. They are:



1 What is the approximate length (in feet) of a half-wavelength dipole antenna for 3,725 kHz?

A 126 feet
B 81 feet
C 63 feet
D 40 feet

2 What is the approximate length (in feet) of a half-wavelength dipole antenna for 7,125 kHz?

A 84 feet
B 42 feet
C 33 feet
D 66 feet

3 What is the approximate length (in feet) of a half-wavelength dipole antenna for 21,125 kHz?

A 44 feet
B 28 feet
C 22 feet
D 14 feet

4 What is the approximate length (in feet) of a half-wavelength dipole antenna for 28,150 kHz?

A 22 feet
B 11 feet
C 17 feet
D 34 feet

5 How is the approximate length (in feet) of a half-wavelength dipole antenna calculated?

A By substituting the desired operating frequency for *f* in the formula: 150 / *f* (in MHz)
B By substituting the desired operating frequency for *f* in the formula: 234 / *f* (in MHz)
C By substituting the desired operating frequency for *f* in the formula: 300 / *f* (in MHz)
D By substituting the desired operating frequency for *f* in the formula: 468 / *f* (in MHz)

OK, without looking at the end of the column, can you answer these questions? If not, then read on.

One of the best antennas we can make is the half-wavelength dipole. It's made by cutting a long piece of wire into two sections, then connecting an end of each section to the feed line. The total length of the antenna is given by the formula:

■ **Length in feet =**

$$\frac{468}{f \text{ (frequency in MHz)}}$$

You can erect an antenna like this almost anywhere (some amateurs even put them in the attic).

With this information, now you should be able to answer the questions above. First, a half-wave dipole for 3725 kHz. From the formula, we get the length as 468 divided by 3.725 (remember—the frequency is *megahertz!*) which is 125.64 feet. Rounding off to the nearest foot we get 126 feet which is answer "A." For the first four questions, we get:

Q	kHz	Band	Calc	Feet	A
1.	3,725	80	125.64	126	A
2.	7,125	40	65.68	66	D
3.	21,125	15	22.15	22	C
4.	28,150	10	16.63	17	C

Get a chart of the bands from your local ham store or from ICOM America, 2380-116th Avenue NE, Bellevue, WA 98004, and determine what class operators can transmit at these frequencies. That's your assignment for next issue.

The last question in the group is obvious—the answer is "D." It is just the formula we gave above for the length of a half-wavelength dipole. So you now know the formula, but what is this mysterious number 468? Well, we have to go back a little bit and remember some high school physics.

In high school, you might have learned that the frequency and wavelength of radio waves in free space (basically you can think of this as outer space) are related by the speed of radio waves, which is186,000 miles per second. That is:

■ **wavelength (miles) =**

$$\frac{186{,}000}{\text{frequency in hertz}}$$

To change this to feet, we remember there are 5,280 feet per mile, so 186,000 miles per second = 982,080,000 feet per second. If we replace the speed in miles per second with the speed in feet per second and change the frequency into megahertz (1 megahertz = 1,000,000 hertz), then we get:

■ **wavelength (feet) =**

$$\frac{982}{\text{frequency in MHz}}$$

or

■ **one-half wavelength (feet) =**

$$\frac{491}{\text{frequency in MHz}}$$

Now things get a bit complicated. A *perfect* antenna in free space would be sized by this formula, but we're not living in a perfect world. Practical antennas are built of real wire that has some thickness *and* there are real objects around the antenna *and* we're not in free space. A *practical* formula, adjusted to take into account these external factors, gives us the formula:

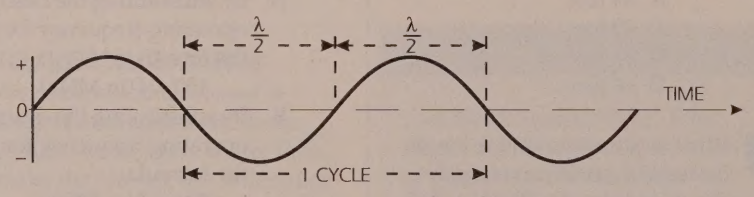
■ **one-half wavelength =**

$$\frac{468}{\text{frequency in MHz}}$$

Are you blinded by the mirrors yet? I'm sorry I must wave a few here and say trust me, but if you *really* want to work it all out, I suggest you look over a copy of John Kraus' book *Antennas*. If you're up to the mathematics, he'll give you all the tools. But you won't find it worked out for you there.

Now that we know how to compute the length of a one half-wave dipole, we should answer the question "Why should I care?" It's really very simple. The horizontal, half-wavelength dipole antenna can be built with simple materials (one piece of wire cut into two equal lengths) and it's very inexpensive. Further more, if the length of the wire is computed for the middle of one of the Amateur radio bands, it has enough bandwidth to put out a good signal throughout the band (we'll go into why in a later column). I've even run a 10-meter dipole in the attic when I didn't want the neighbors to complain about unsightly wires!

All things considered, a dipole antenna is something you should always consider for its very simplicity. If you have enough space to put up several at home, they will give reliable and consistent service. If you're out for Field Day, it's one of the simplest antennas you could erect. ❑



hertz (Hz) = unit of measurement equal to 1 cycle per second
kilohertz (kHz) = 1,000 hertz
megahertz (MHz) = 1,000,000 hertz
f = symbol for frequency
λ = symbol for wavelength
5,280 feet = 1 mile
186,000 miles per second = speed of radio waves in free space

If you include a self addressed, stamped envelope, Terry Dettmann will reply personally, whether or not he can get the answer in his column. The mailing address is via the National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond, WA 98052. If you're on CompuServe, you can write to him at 72076,2611 and he'll answer you there.

A Short History of Amateur Radio Regulation

Fred Maia, W5YI
National Volunteer Examiner
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BY FRED MAIA, W5YI

The ham radio hobby is one of the few leisure-time activities that is governed by every type of rule, law, and agreement imaginable! There are voluntary band plans, community agreements (called "covenants" that restrict certain activities), local laws that impact what you may do on your property, and state laws such as those concerning possession of certain communications equipment. Amateur Radio operators must abide by federal regulations that are enacted consistent with international law! This column will be the first of two that will cover the matter of Amateur Radio regulations. We will first tell you how it was, and later—the procedures of today.

Radio knows no boundary. It doesn't stop at the edge of state or national borders. By its very nature, it is international in scope. The first international treaty was signed in 1849 between two European countries that were linked by telegraph lines. Other treaties followed in the 1850s. Before these treaties, it was not unusual for telegraph operators to physically hand their messages to their counterparts at the frontier borders.

THE INTERNATIONAL TELECOMMUNICATION UNION

In 1865, the French government sent out invitations to all the major countries in Europe to attend a Paris conference to negotiate an international telegraph system. Twenty countries accepted and the International Telegraph Union was born. In 1906, wireless radio was added to the ITU's activities. The first ITU frequency allocations were made in 1927 whereby member countries agreed on which wavelengths to use for specific services—including the Amateur Radio Service.

The name of the International Telegraph Union was changed in 1932 to the International Telecommunication Union to reflect the expanded responsibilities of the organization. In 1947 the ITU became a specialized agency of the United Nations. Its headquarters moved to Geneva, Switzerland the following year. The ITU exists to reduce radio wave interference.

Ham radio, as it has come to be, is the oldest of all of the radio services. There were Amateur Radio pioneers before there were professionals. The early pioneers had access to the entire radio spectrum. Once the value of radio became apparent, the Amateur spectrum was reduced to provide for other uses.

FIRST PRACTICAL APPLICATION

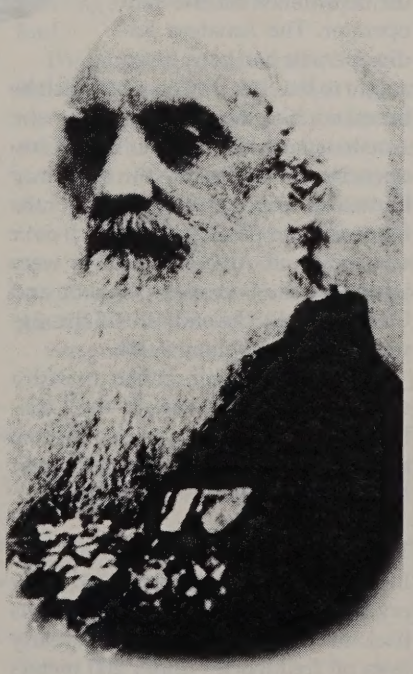
Except for experimentation, the first real practical application of radio was the radiotelegraph. Guglielmo Marconi, an Italian inventor, sent and received his first radio signal in Italy in 1865. In 1899 he flashed the first wireless signal across the English Channel. Two years later he received the letter "S," telegraphed from England to Newfoundland.

The U.S. Navy adopted a wireless system in 1901 and marine radio was born. Until then, the Navy used visual semaphore signalling and homing pigeons. Marconi sent the first eastward transatlantic radiotelegraph message in 1902. The first radio distress call from an American vessel occurred in 1905. In 1912, the ill-fated Titanic also resorted to wireless.

Amateur Radio as we know it, leisure two-way hobby communications, is believed to have begun around the turn of the century. For the first decade of its existence, Amateur Radio flourished without regulation. From 1902 to 1912, twenty-eight bills dealing with radio were introduced into Congress. One bill even sought to have the government (meaning the U.S. Navy) have complete ownership and operation of all radio stations. Fortunately, all these bills were defeated.

REGULATION AND THE RADIO ACT OF 1912

In 1912, regulation finally came to Amateur Radio. During the London World Radio Conference of 1912, historic "Regulation Fifteenth" stated that private stations (meaning Amateurs) could not use wavelengths in excess of two-hundred meters except by special per-



Samuel F. B. Morse, 1791–1872

mission. International lawmakers had finally come up with a regulation that would keep the Amateur Radio tinkerer from communicating cross-country on the lower frequencies that would be used by commercial and government stations. To carry out the international obligations under the London treaty, President Taft signed the Radio Act of 1912 into law on August 17th, 1912.

The Radio Act of 1912 was the first law for the domestic control of general radio communications. It regulated the character of emissions, the transmission of distress calls, set aside certain frequencies for government use, and placed the licensing of all wireless stations and operators under the Secretary of Commerce and Labor. The Act also provided for the first radio licensing which began that year.

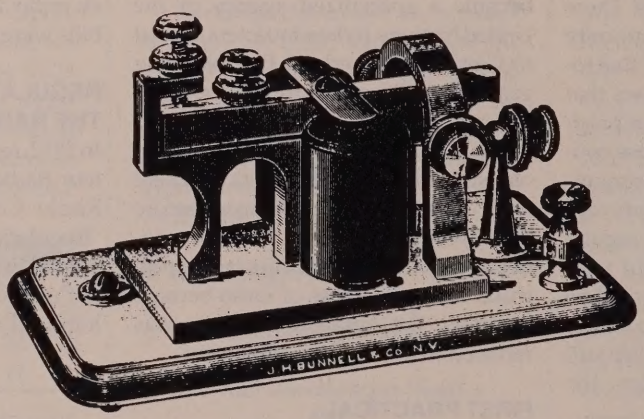
It had long been determined by radio engineers of that era that wavelengths of 200 meters and shorter were totally worthless for radio communications. Since they were thought to be of little value, the "shortwaves" were handed over to the Amateur experimenter. The government had been successful, or so they thought, in sounding the death knell for the ham operator. The Amateur Radio operator had been given a right to live, but the space in which he breathed had been eliminated—the Amateur was left with no useful frequencies to use. Despite the frequency limitations imposed, in the four months following the passage of the Act, over one thousand Amateur licenses were issued by the Secretary of Labor and Commerce. By the end of 1913 this figure had reached about 2,000.

Happily, Amateurs ended up with a situation similar to that of the Oklahoma Indian who was herded off to a reservation on a piece of worthless desert land—only to find it soaked with oil!

THE DISCOVERY

In the 1920s, Amateurs made a discovery that quickly brought governments back into the shortwave field! The early tests on frequencies under 200 meters indicated that radio ranges were indeed extremely limited; signals were totally unpredictable and faded out quickly. What no one ever thought about was that they came in again—often loud and clear, thousands of miles away after being reflected from the heavens. It took nearly 20 years after the discovery of radio for the Amateur to stumble onto this phenomenon. Who would have thought to place a radio receiver thousands of miles away from a transmitter when it was believed that radio ranges under ideal conditions were only a few hundred miles?

During the First World War, governments began using radiotelegraph to keep abreast of events and to direct the movement of troops and supplies. Amateur Radio was silenced during World War I, and came very close to being permanently silenced for all time. The government, having had complete control of all communications from the period 1917 to 1919, wanted to maintain their total jurisdiction. Fortunately, the pleading of the Amateur experimenter finally won out and the radio hobbyist returned to the airwaves in 1919 by the hundreds.



Bunnell's Sounder, patented in 1875

As early as 1916, David Sarnoff, a young wireless operator, contemplated a "radio music box" that would receive programs broadcasted for public information and entertainment. When the Radio Corporation of America acquired the American Marconi Company in 1919, Sarnoff became its manager and convinced the company to go into the radio business. The RCA Board put up $2,000 to develop a receiver.

About that time, Amateur Frank Conrad, operator of station "8YK" in Pittsburgh, began playing music from his garage station. Overnight it seemed everybody wanted to listen in! Radio sets were still few and far between; only the wireless Amateurs had the means of listening. While the electrical manufacturers were tooling up, thousands of young and old "Marconi's" began building their own "radio music boxes"—crystal detector sets.

THE NATION'S FIRST BROADCAST STATION

In 1920, Amateur station "8YK" became KDKA, the nation's first broadcast station working on a wavelength of 360 meters. Other commercial broadcast stations quickly followed. By January 1923, a total of 595 broadcasting stations were on the air—all on the same frequency! Bedlam resulted! Broadcasting had arrived, but it was obvious that additional regulations and allocations of radio frequencies were needed. Station KDKA, by the way, is still on the air to this day!

The Radio Act of 1912 did not anticipate broadcasting. In 1927, a temporary agency called the Federal Radio Commission was created and given broad regulatory powers over all forms of radio transmissions. Much of its early activity was devoted to resolving the interference problems of the broadcast band.

FCC IS ESTABLISHED

The Federal Communications Commission was established with the passage of the Communications Act of 1934 that was aimed at regulating all wire and radio telecommunications. A section of the Communications Act, Title 47 CFR (Code of Federal Regulations) Part 97 governs the Amateur Radio Service in the United States. Title 47 applies to telecommunications. The FCC's five commissioners are appointed by the President with the approval of the Senate. The President appoints the commission chairperson.

Organizationally, the FCC is arranged into administrative bureaus. The Ama-

teur Radio Service falls under Personal Radio Branch, a section of the Special Services Division in the Private Radio Bureau. The FCC may only adopt regulations that are consistent with international treaty agreements to which the United States is a party.

THE TEN INTERNATIONAL LAWS

Other than frequency allocations, there are only ten international laws that specifically apply to Amateur Radio. They state that:

1. Amateur communications are forbidden if one of the countries involved objects.
2. When Amateur communications are permitted, the content must be in plain language and of an unimportant personal or technical nature.
3. Messages on behalf of others are permitted if allowed by the countries involved.
4. Operators may only operate an Amateur station without Morse code knowledge when the communications take place above 30 MHz.
5. It is the responsibility of the countries involved to verify the operational and technical qualifications of its Amateur operators.
6. Operator qualifications and operating conditions must be taken into consideration when authorizing maximum power levels.
7. All General Rules apply to Amateur stations. In particular, the emitted frequency shall be as stable and as free from spurious emissions as the state of technical development for such stations permits.
8. Amateur stations shall transmit their call sign at short intervals. The first characters of a call sign indicate the country of origin of the transmitting station. Prefixes beginning with K, N, W and certain "A" prefixes are assigned to the United States.
9. Amateur satellite stations operating in shared (with other services) bands shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported.
10. Nations authorizing Amateur stations operating from space must notify the International Telecommunication Union that sufficient earth command stations are established before launch to guarantee that any harmful interference can be terminated.

The International Telecommunication Union divides the world into three areas. North and South America are ITU Region 2. Most major Amateur Radio frequency allocations are the same for all three ITU regions. This permits Amateurs throughout the world to communicate freely.

CANADIAN AND UNITED STATES TREATY

There is also a treaty arrangement (1952) between the United States and Canada that allows visiting Amateurs to operate in the territory of the other country without further licensing. The visiting Amateur must identify with his own call sign followed by either the slant bar (telegraphy) or by the words "fixed," "portable," or "mobile" followed by the Amateur call sign prefix and call area number of the country he is visiting.

For 50 years, the FCC determined the qualifications of those individuals who would be licensed as Amateur Radio operators. In 1983 the Commission completely deregulated the examination procedures of its Amateur service. In our next column we will cover this new program called the VEC System. It provides for accredited volunteer examiners to administer all Amateur license examinations for FCC-issued Amateur Radio licenses.

VE NEWS

The first letter to arrive from a VE was from Henry C. Fox, WA5VHY, of Hurst, Texas. Henry enclosed a copy of an Amateur license (see below) issued to Mr. Walter Hammond, for 9AJY, in September of 1922. He tells us that "Walter let his ticket expire many years ago but was determined to get it back." At age 86, Walter has been issued his new call sign, N5TVV. After having completed his "no-code" requirements, he is now enrolled in the Hurst Amateur Radio Club Farnsworth code class. Walter is truly an inspiration to all of his classmates because of his determination to make up for some of the things he missed in ham radio. His son Myron has passed his General theory and is attending the code classes with his dad.

You may not be able to read the reproduction of 9AJY's license, but it carries a stamped endorsement stating "This station is not licensed to broadcast weather reports, market reports, music, concerts, speeches, news or similar information or entertainment."

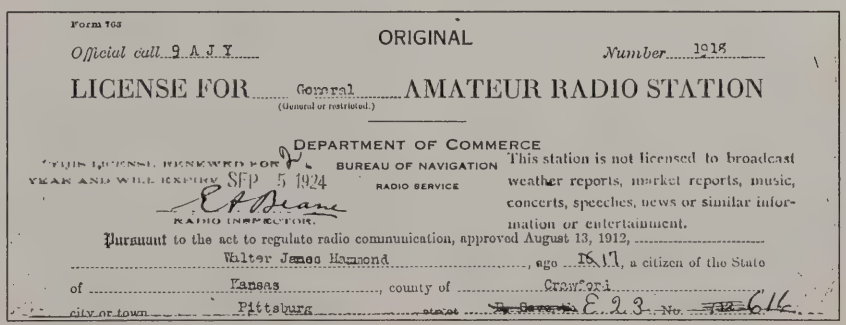
INTERESTED IN BECOMING A HAM OPERATOR?

Today, becoming a ham operator is easier and faster than ever! You don't even need to learn Morse code any more! Thousands of newcomers are joining the Amateur Radio operator ranks monthly! Believe it or not, the only requirement is that you must correctly answer 41 out of 55 multiple-choice questions. All the questions and correct answers are known and widely published. The Amateur Radio hobby is growing as never before! Come join the fun!

For more information call toll-free 1-800-669-W5YI (9594). The W5YI Group has complete, low-cost study material available that will speed you on your way toward becoming a licensed Amateur Radio Operator. Ask about our "No Code Ham Radio Education Package." We'll even tell you the nearest location of a testing session! Chances are it is right in your own city.

See you next month.

73, Fred, W5YI ❑



Form 705

ORIGINAL

Official call 9 A J Y *Number* 1918

LICENSE FOR General AMATEUR RADIO STATION

(General or restricted.)

DEPARTMENT OF COMMERCE

BUREAU OF NAVIGATION

RADIO SERVICE

THIS LICENSE RENEWED FOR 1 YEAR AND WILL EXPIRE SEP 5 1924

E A Beane

RADIO INSPECTOR.

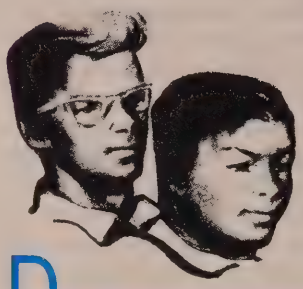
This station is not licensed to broadcast weather reports, market reports, music, concerts, speeches, news or similar information or entertainment.

Pursuant to the act to regulate radio communication, approved August 13, 1912,

Walter James Hammond, age 18 yrs, a citizen of the State of Kansas, county of Crawford, city or town Pittsburg, street ~~No. General~~ E. 23 No. 616.

THE • ADVENTURES • OF

Dan & Burke



Dan decides to power the world with solar energy.

Dan Lewis entered the house in his usual forceful manner. That is, he whipped open the door, took a giant step across the threshold and slammed it shut, all without missing a step or changing his stride. Next, he dog-trotted down the hall to the open door of the living room where he stopped briefly to execute a powerful slam-dunk with his schoolbooks into the davenport cushions. Finally, he spun into the kitchen like a whirling dervish. With almost a continuous motion he jerked open the refrigerator door, lifted out a pint carton of chocolate milk, downed it with four or five thirsty gulps, and banged the door shut. The empty carton flew across the oak dining table into the sink as the boy slammed out the back door.

Upstairs in her sewing room Mrs. Lewis listened to the progress of this miniature door-slamming tornado as it moved through the downstairs part of her house. There was no particular sign of annoyance on her time-etched face. In the first place, she was used to it; and in the second, she experienced that warm feeling of contentment a mother gets when she knows her children, be they four or forty years of age, are safely home. Even though Dan had gone out the back door, she knew he was headed no farther than the basement "laboratory" of his friend, Burke Olan, next door.

As Dan skipped down the outside basement steps and burst through the door, his eyes were met by a singular sight: Burke's well-padded form was sprawled on the couch at one side of the room. Although it was still broad daylight, he held a lighted flashlight in his hand and was waving the narrow beam back and forth across the face of what looked like a small birdhouse sitting on the workbench along the opposite wall. Each time the spot of light passed over the quarter-sized opening in the face of the box, it gave out a loud shriek like a smoke alarm.

Dan slumped against the door-jamb and said lugubriously, "The mad-man has finally freaked. I always knew this would happen! That's what comes of reading physics texts and transistor manuals instead of watching MTV like any other red-blooded, Madonna-lovin' guy. You lack originality Burke. Diogenes used the carry-a-light-in-the-daytime gig several centuries ago."

"That's my man!" Burke exclaimed as he grinned at Dan. "If you don't understand anything, belittle it, is the motto, huh? Had you not been so intent on making a wisecrack about the flashlight, you might have noticed some correlation between my moving its beam back and forth and the sound you hear."

"So-o-o-o?" Dan drawled with quizzically arched eyebrows.

"So I'm experimenting with solar cells like the ones that power our space satellites. Notice that as long as I keep the beam of light on the solar cell inside that hole in the box, the acoustic alarm continues to sound off, but it stops as soon as the light is taken away."

"Say, that's pretty cool!" Dan said with sudden enthusiasm. "Let me do it. How does it work?" he asked, as Burke let him take the flashlight and play it back and forth across the opening in the box.

"Do you really want to know or have you suddenly had an attack of politeness?" Burke demanded.

"I really want to know, stupe!" Dan growled, "And you're just aching to lecture; so quit stalling and get on with it."

"Okay, but first I've got to know if you remember anything at all of what you learned in physics about

the construction of an atom."

"Of course I remember," Dan said indignantly. "An atom has a positive nucleus about which circle tiny negative dudes called electrons. There are always just enough of these electrons in a normal atom so that their total negative charge is equal to the positive charge of the nucleus, leaving the atom with a neutral charge. Under some circumstances, though, an electron can be pried loose from its atom and go tooling around by itself. An atom that has lost an electron assumes a positive charge and is called an ion. Electrons are attracted to any positively charged object. Ions dig negatively charged things."

"You never fail to amaze me!" Burke remarked as he lifted the cover of the box and disconnected a tiny, rectangular blue slab. He tossed it to Dan. "You can see this solar cell has only two wires on it. There is a metalized back that holds a slab of silicon. During manufacturing, impurities are diffused into the silicon on the surface opposite the metal backing. A tiny metal electrode is attached to this surface of the chip."

"It sounds like you are describing a semiconductor diode, my brainy friend." commented Dan.

"Bingo Danielito! That's exactly what it is. The electrode on the back, with the black wire attached, is the cathode. The electrode plated on the edge of the front side connects to the red wire. It's the anode. You can't see it but there is a tiny conductive surface on the silicon which is connected to the anode. Light will pass through it, but electricity is conducted by it," Burke explained.

Dan was starting to get into the discussion. "An obvious question, coach. Where does the electricity come from?"

"Let's see. How can I explain this in words that won't stress your brain cells? Ahhh, yes, now I have it. Did you ever see an apple fall from the very tiptop of a tree heavily loaded with very ripe fruit?"

"Sure, but what do ripe apples have to do with solar cells?" Dan questioned.

"Perhaps you noticed that on the way down, the falling apple struck other apples and dislodged them so they fell with the first apple. The branches on which these apples had been clinging jerked upward as they were freed of the weight of the dislodged fruit. This movement knocked loose still more apples from the branches above them. The net

result could easily be a dozen apples falling to the ground as the result of the loosening of that first apple from its stem.

"The same thing happens inside the silicon solar cell. When the surface of the cell is dark, the silicon atoms chill out and are dormant. Then some light photons come scampering merrily along and knock loose a few electrons from the silicon atoms. The silicon atoms are converted into an ion by the loss of an electron and are attracted to the cathode. As they move to the cathode, the threshing around knocks loose still more electrons that are free to go to the anode. Just as happened with the apples, for every electron that is freed from the silicon atom by the influence of light falling upon it, a larger number of electrons will reach the anode. This action causes a potential difference to appear across the red and black wires."

For once Dan was astounded. "These cells convert light energy directly into electricity without first going through some other form such as heat or motion. These things must cost a bundle," Dan surmised.

"Actually they are pretty inexpensive. Remember silicon is the main ingredient of common sand," Burke reminded his awe-struck friend.

"How can a solar cell do any useful work? That little blue slab sure wouldn't keep the batteries in my laptop charged," Dan heckled.

"A solar cell in full sunlight with a light load, no pun intended, will generate about six-tenths of a volt. When delivering the maximum current the cell is capable of, the voltage drops to about half this figure. Even a low-efficiency cell, which is about all an experimenter can afford, will deliver about 100 milliamperes of current for each square inch of active surface area. Groups of cells can be connected in parallel for additional current or series for more voltage output. Or you can use any combination to design a solar cell *array* of any desired output capability. If the cell is not heavily loaded, it can produce good voltage output with much less than full illumination. Even on cloudy days, the silicon solar cell can produce usable output with the little sunlight that filters through the gloom."

Dan's social conscience saw an immediate chance to save the world with free electricity. "Every single day the sun bathes the earth in more than 1,000,000,000,000,000,000 kilowatt hours of energy. This daily gift of radiated energy is equal to all the energy that is contained in the world's reserves of coal, oil, natural gas, and uranium combined! This is why some of the 'no-nuke' crowd get so excited. We let all this energy go to waste. We have done relatively little to harness the sun's rays."

"Well, it doesn't all go to waste,"

Dan & Burke

Burke reminded his friend. "We make a very tiny fraction of this daily gift work for us. Silicon solar batteries have been used to power almost everything imaginable. Transistor radios and calculators are an obvious application. Power for space satellites is another. I'll bet you didn't know those emergency telephones alongside the highway are usually solar powered. It's seldom convenient to run power lines to the location of these motorist emergency radios."

"I'll bet a solar cell is used in my dad's camera for the light meter," Dan mused.

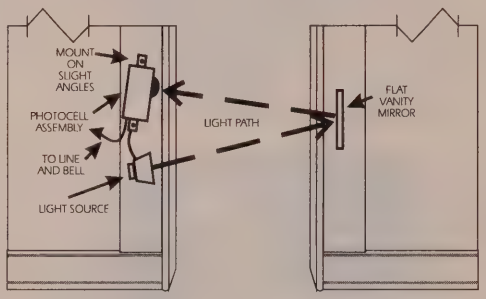
"It could be. A number of different circuits are used. But the current put out by one of these photovoltaic cells can be employed to directly deflect the needle of a sensitive meter. This is what is done in the older exposure meters that were separate from the camera. Rather than silicon, less expensive and less efficient selenium was used in the light cell. This powered a sensitive, calibrated microammeter so that the meter reading indicates the *footcandles* of light falling on the cell window."

"Do you hams use solar cells in your high-tech goodies?" Dan needled his friend a little.

"Not much anymore in equipment but some Amateur Radio operators go to ham conventions wearing a cap with a motor and propeller driven by a bank of solar cells. It doesn't do anything but attract attention. But some enterprising soul mounted the motor pointing forward and created an anti-smoker, solar-powered hat!"

"How come you've got other parts in the box? I see a transistor in here, besides a relay and that noise maker, plus a bunch of resistors. Why don't you just use the voltage to power a sound generator?"

"Because the voltage generated by the cell is very tiny. Even if it were in direct sunlight it would still measure less than a volt. The weaker illumination of the flashlight generates even less voltage. Remember, a satellite uses hundreds-of-thousands of these little diodes connected in series-parallel arrays. I suppose the voltage could be used to trip the relay directly but it would be very delicate and undependable. It is much more practical to employ some sort of amplifier between the cell and the relay. I use a switch transistor to control the relay. The relay is simply an electromagnet that attracts the armature on which the contacts are mounted. When the relay "trips," connection is made between the battery and the Mallory Sonalert which makes that awful whistle."



"Are there other types of photoelectric cells beside this solar cell?" Dan questioned.

"Sure thing. This little chip is what is known as a 'generative' type because it generates electricity. But there is also a 'conductive' type of cell. This gizmo has two electrodes connected to a material called cadmium sulfide. This chemical exhibits a change in resistance in accordance with the amount of light falling on it. A typical cell might have 30 million ohms of resistance in the dark and only a few hundred ohms in bright sunlight. Such a cell behaves differently than a solar cell in a number of ways. It's a variable resistor and not a diode. It does not generate electricity and therefore has no polarity. It is also less subject to damage by high voltages. Since the cad-sulfide cell simply acts like a variable resistor, this type of light meter needs a battery to make the meter move."

"That's all well and good, my friend but what is your 'squawk box' good for?"

"Well," Burke drawled, "How about as a burglar alarm or a warning when someone is coming down a narrow passage? Here's a sketch in my lab notebook on how you could mount my setup in either case. Whenever the beam was broken, the alarm would sound."

Dan stood up and stretched until his joints cracked. "That's the way it goes," he mourned. "No longer will I be able to experience simple pleasures from watching the electric-eye door at the supermarket swing open at my approach. Now I'll be thinking about relays, electrons, silicon cells, and cadmium sulfide. Worse yet, when I'm trying to get a sun tan, I'll be feeling guilty about all the solar energy I'm squandering!" ❑

Dan and Burke is based on a storyline created in 1954 by John Frye, W9EGV. The boys are the sons of John's original characters, Carl and Jerry.

John Frye is no longer with us. But while he was alive, John was an avid Amateur Radio operator who wrote about young people—for young people.

It's doubtful that anyone could make John's stories more interesting or improve on his words. We'll settle for giving them a 1990's twist.

If you would like to learn more about becoming an Amateur, write to the National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond, WA 98052 or call 1-800-GOT-2-HAM (1-800-468-2426).

A Helping Ham

An "old-timer" describes his efforts to introduce Amateur Radio into the Chicago School system.

BY HOWARD S. WAYMAN, W9GVA

The year was 1921 when I first saw an article showing how to build a radio. I discussed the *Mechanics Magazine* plans with the boy next door. He mentioned his cousin was an Amateur Radio operator and asked if I would like to see his station. We could ask him what he thought about building the radio.

Of course I was enthused and a day or two later the arrangements were made. We got on our bikes and rode over to his cousin's home. I was introduced to Russell Groth, W9CW. In his living room I saw a fine looking piece of furniture called a radio receiver. The front had some dials, switches, and knobs showing. In the center were five binding posts to which was attached a glass tube. Russ turned it on and the tube started to glow. He twirled some dials and we heard some code being sent. Russ promptly pulled a telegraph key from a drawer and started responding to the code we heard. With each press of the key, the tube would glow brightly. What a thrill! I would have to start studying immediately to get an "Amateur Radio license.

Through the years many hams were a great help as well as an inspiration to me. Certainly, one was Fred Schnell, W9UZ, who lived in the neighborhood. Fred was one of those present during the first transatlantic transmission tests.

Recently, I sat in my recliner in the living room reading one of the newsletters I receive. The author was telling how short the United States was of electronic and electrical engineers. The future looked bad if we didn't find a way to acquaint our youth with the virtues of the electronics field. I wondered could I, as a construction engineer, help this situation? I wanted to do my part to help my hobby and return the favors of the hams who had taken the time to help and assist me.

At the time, the Chicago School system was being changed from a central control system to an individual school system by the parents. The Edgebrook Elementary School was one of those to pioneer the new system. Academically, Edgebrook always had been in the top ten of the city schools.

Days later, an article appeared in our neighborhood newspaper regarding Edgebrook School, advising they were looking for volunteer help in the school. I wondered what they would think of a new subject in the school? After working for 28 years with the Boy Scouts and youths, I knew it would be a pleasure to do it again.

I made up my mind to see if the school was interested. I had previously been told that the principal was a young and ambitious woman who wanted to promote and further the education of the school children. I phoned Dr. Diane Maciejewski, the principal, for an appointment. She was most easy to talk with. I presented my idea to a delightful person. Would she be interested in my teaching the Novice Amateur Radio Course in the school? I had come prepared with all the literature I could find. After the meeting, I followed up with additional articles along with Carole Perry's story as well as some of Gordon West's enterprises.

Time passed and I thought I had failed to strike a responsive chord. However. I received a call from Dr. Maciejewski in March 1988 to come in for a second meeting. I was introduced to the 8th grade teacher to see what we could work out. He was thrilled with the idea and assisted me in every way possible. I started a class with six pupils. The 17 hours teaching time from March to June was not enough. Three students passed their theory test. However, none came near to passing the code exam.

The year 1989 passed as the new school system was being reorganized. In September 1990 I received a call to come in again to try another class. I had suggested we send a letter out to the parents and grandparents inviting them to join us. Three boys, one

From the left are Charles Sikorski, Bradlee Kuzmin, instructor Howard Wayman, Karl Hunsicker and Ralph Sikorski (dad).

teacher, and one parent showed up. I brought to their attention the two ways we could proceed with the studies. One was the Novice license which included a five word-per-minute code test and a pool of 350 questions on Rules and Regulations, operating procedures and theory. If they passed the Novice test, it would allow them to operate code on several Amateur bands, as well as phone on a portion of the 10-meter band. This band would let them talk around the world. The alternative was a proposed (that since has been approved) no-code route. They would still have to pass the code in the future to be able to communicate world-wide. It was unanimous to go the Novice route. All five have passed their Novice Class license, one has his Technician Plus license and two other boys are working on their Technician Plus licenses.

In closing, I'd like to say a few words to my many friends in the Quarter Century Wireless Association. Everyone wants to see our youth given a chance to find out what the electronics field is all about and what an opportunity studying for a Amateur license gives them. It provides something tangible for their efforts—a license to operate a radio transmitter and permitting them to talk to the world. I'm sure most school principals will be delighted to have you offer to further the knowledge of their students by teaching a Amateur Radio course during school or immediately after school. There are many tools available for your use both to promote electronics and educate our children *(see Gordon West's column—Ed.)*. Remember, our hobby is not growing in numbers and we need people like you to promote it to our children. Talk to the principal of the school nearest you. I am sure you will be welcomed. Things don't happen quickly in the education world. You may have to wait until next semester to get a class started. If teaching seems too much for you, make yourself known as a "Helping Ham" to anyone in your neighborhood who might like to know about Amateur Radio. ❑

To contact the author write to: Howard S. Wayman, W9GVA, 6760 N. Ionia Avenue, Chicago, IL 60646.

Codeless Technician License a Huge Success

The number of Technician licenses issued averaged 208 per month in 1989 and 218 per month in 1990. However, in February 1991, the FCC introduced the new Technician class license that did not require a proficiency in Morse code. In April of this year, there was a 1250 percent increase over the same month in 1990.

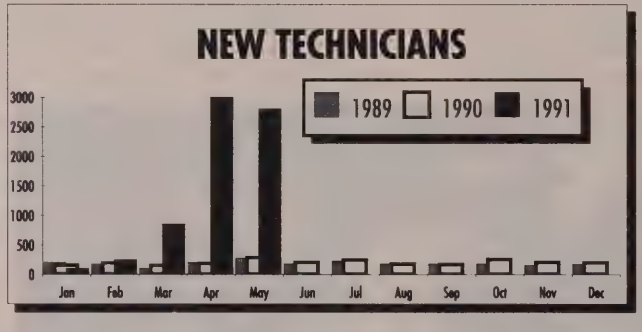
There was more than a 50 percent increase in the number of examination elements administered in March and April 1991 versus one year ago. May 1991 saw more than double the number of applicants tested and exam elements administered. VE's, VEC's and the FCC have been very busy keeping up.

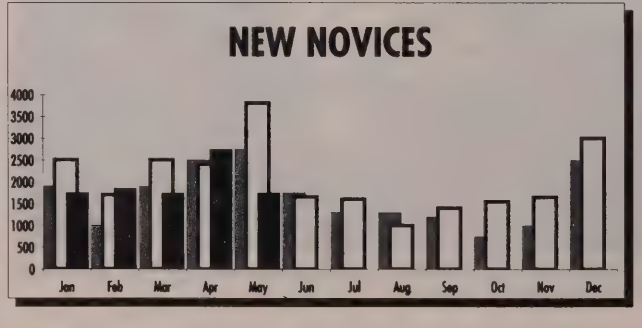
While the number of new Novices increased 14 percent in April 1991, there are substantially less new examinees joining the ranks at the Novice level than a year ago. Note the drastic reduction in May 1991 versus 1989 and 1990. Apparently most applicants are choosing the Codeless Technician route to enter ham radio.

Last year an average of 2,315 applicants per month joined the ham ranks for the first time. During the past 60 days, over 10,000 ham operators got their initial license. More examinees are passing the tests! The pass rate has jumped by six percent (66% versus 60%) since February 14, 1991 (the introduction of the Codeless license).

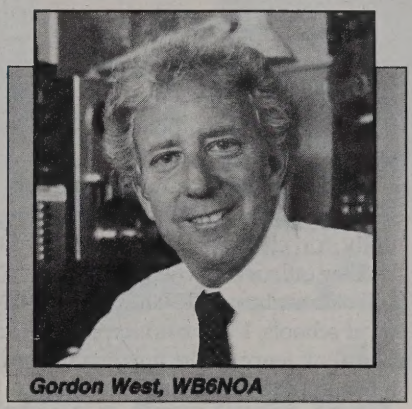
The best news of all is the upgrades. At NARA, we predicted that once Morse code was no longer an obstacle to entry, it would be perceived as a challenge and a "fun thing" to do, besides all the other facets of the hobby. We were right! At the VEC Conference in Gettysburg, Pennsylvania, the FCC told us that the number of upgrades from the Novice and Technician classes to the General class is now up 47 percent over last year! ❑

(Thanks W5YI Report and FCC).





Live Equipment in the Classroom



Gordon West, WB6NOA

BY GORDON WEST, WB6NOA

Every class session should feature at least 20 minutes of live equipment operation. You can talk to your students all day about "international goodwill" when contacting a foreign country, but nothing makes the point better than a hook-up with a VK2 (Australia) on 10 meters to punctuate the excitement of the friendship hams can have thousands of miles apart.

The hand-held VHF or dual-band VHF/UHF transceiver is always good for a few classroom demos. Try to hook up your handheld to an outside antenna to avoid the embarrassment of chopping in and out of the repeater because your signal is not line-of-sight out of the classroom to the distant repeater site. The students are quick to pick up that your little handheld isn't quite making it when the fellow on the other end gives you a lousy reception report. You can explain to them all day that a little rubber duckie antenna inside a room isn't the best antenna to use, but why not do it right the first time and connect some type of outside antenna that will nicely do the trick? Although you're hooked up to a piece of coax cable, they'll still get the idea that a handheld is terrific for portable contacts.

A mobile 25-watt VHF or UHF rig is also ideal for classroom demos. It allows the students to see clearly the frequency readout when you illustrate repeater offsets. Let them watch as you tune in a repeater on 146.940 MHz and punch in the minus offset. Have them read you the exact transmit frequency at 146.340 MHz—then have them compute the 600 kHz offset difference. Next, go to UHF and let them compute the difference themselves by watching the radio toggle between receive and transmit. You can't show this easily on a handheld, but on a bigger mobile set—especially a mobile set with a remote-controlled head, the offset is easily explained when seen in actual operation.

It's good to place the 25-watt mobile VHF or UHF antenna outside and away from anyone in the classroom. This keeps unwanted RF outside the classroom. It also keeps younger kids from wondering what would happen if you were transmitting and they touched their tongue to the tip of the antenna. I don't know why they might do it, but the possibility remains—so get that mobile antenna up high and out of the way of curious children. Also, make absolutely sure there is no way someone could trip over the feed line as it snakes into your classroom and up to the operating table.

For mobile 25-watt transceivers, a little 12-amp power supply will work nicely. I like the Astron (Irvine, California) power supplies because they feature overload protection and automatic short-circuit shutdown. The only problem you might ever encounter with any modern microprocessor-based power supply is its sensitivity to RF too close to its innards. Never place a magnetic antenna mount directly on a power supply because every time you transmit, the modern power supply will sense something is wrong and automatically shut down until you stop transmitting.

For high frequency, I either lug in an all-band, AC-type transceiver, or opt for a lighter 12-volt DC, HF transceiver, along with an Astron 20-ampere power supply. I prefer the metered power supplies because they allow the instructor to illustrate visually voltage to the transceiver, plus the amperage the trans-

Photo by Dan Fort, AA6LM

Live equipment is always a big hit in the classroom.

ceiver will draw during both modulation peaks and CW. It costs about $10 more for the power supplied with built-in metering, but it's worth it.

Mobile whips, or a multi-band Spider whip antenna assembly, work quite nicely for classroom demonstrations, but they only work when placed over a suitable metal ground plane. If I'm teaching at schools, I will counterpoise off a chain-link fence or the junglegym bars in front of the classroom. You can successfully use a metal folding chair on 10 and 15 meters, but there's not enough counterpoise to let the chair work on 40 meters.

I won't use a metal mobile whip for safety reasons. There's always someone who will go out there and touch the whip when you're trying to transmit—getting a nasty 100-watt RF burn. I will sometimes use helical-wound, plastic-covered whips from Mobile Mark (Chicago, Illinois), or the new Outbacker antenna that has all of the ham bands on it, in taps, and is 95 percent covered with a polyurethane coating that won't give any prying fingers a burn. It's also a neat antenna to run in the classroom because you never have to carry around whip tips that could poke some unsuspecting student in the face if handled improperly. The Outbacker loads up with almost anything as a metal counterpoise below its base, and a single feed line with multiple taps allows you on any band at any time.

During the evening hours, I like to run demos on 80 and 40 meters, and possibly 20 meters if the band is still open. Contacts on 20 when the band is open are exciting to the students because they are normally more than a couple thousand miles away. On 40 meters, your evening contacts will be 800 miles away; and on 80 meters, you'll probably talk up to 150 miles.

During daytime weekend classes, 10 and 15 meters are my first choices for worldwide demonstrations. Ten meters is good because your antenna's ground plane requirements are minimal—a folding chair usually works well. Ten meters also comes in with rock-solid contacts, and QRM is certainly less on 10 than what might be expected on 20. Also, with 10-meter operators, you'll rarely find someone who won't spend a few minutes with your students and encourage them to jump into ham radio with both feet. I can't say that much for the 20- or 40-meter bands. On those bands, there is a 50 percent chance of ending up with an operator at the other end of the circuit that will start bellyaching that we already have too many hams as it is; the last thing we need are more hams, or screaming at you because you're within 8 kHz of the old-timers net that has exclusive rights to this spot on the frequency dial. I try to avoid demos on 20 and 40 whenever possible just because of this problem.

I normally run RG8/X coax in 100-foot lengths as my main HF feed line. Loss is less than 1.5 dB, yet it's bigger than RG58, which could cut your ultimate power output almost in half at 100 feet. I wouldn't use any feed line shorter than 100 feet because many times you have to go quite a distance to find a suitable ground plane. Finding a wide open area for your temporary classroom antenna is one thing, but finding a suitable horizontal metal ground plane is yet another, although it can be done. Remember, a folding chair works quite nicely on 10 and okay on 15 meters. A step ladder (aluminum) makes a great 20-meter counterpoise for a classroom outside antenna demo.

I also like to demonstrate what RF is all about using fluorescent light tubes. I should caution you never to let a student near any transmitting antenna. Do the tube demo yourself, having another ham (legally) key the radio to transmit on a clear frequency, and watch as the RF illuminates the fluorescent tube. At nighttime, the fluorescent tube can be seen glowing as much as five feet away from a 100-watt antenna system, and students really remember this demo.

Live units, turned on, create excitement. Next time you go into a ham store to leave brochures about your class, look at the live sets turned on. Show me a ham store without any turned-on equipment, and I'll show you a missed opportunity. Get some sets that are live, judiciously hide the mikes from younger students' prying hands, and watch the excitement grow as you place that worldwide CQ call. Watch them gather around you when the other op says, "QTH here is London, England." When they can hear for themselves how far you talked on a tiny antenna sitting on top a folding chair, they will be convinced that ham radio is just the thing for them.

Nothing beats a live equipment demo in the classroom.

73 Gordon, WB6NOA ❑

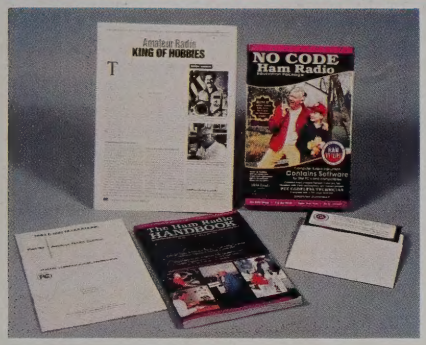
Photo by Martha Lostrom, KA1UUO

Staff from manufacturers, such as Cush Craft's Ed Hammond (right), will help demonstrate ham accessories for your class.

CQ ALL SCHOOLS ON THE AIR

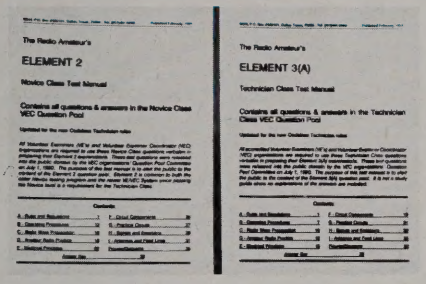
Every Tuesday and Thursday morning, at approximately 1800 hours UTC, Carole Perry, WB2MGP, and Gordon West, WB6NOA, go on the air with the 10-meter CQ ALL SCHOOLS net at 28.303 MHz. If you are teaching a day class, or teaching in the school systems be sure to tune in. Join Carole and Gordo for a lively classroom-to-classroom contact. Prepare to QSY up the band as soon as you make contact with another classroom on the air.

AVAILABLE FROM NARA



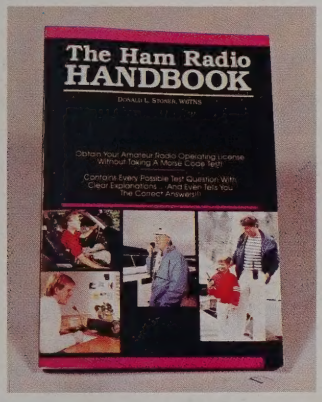
Pass The New Codeless Technician Test!

The NARA Educational package from the National Amateur Radio Association includes *The Ham Radio Handbook,* IBM compatible software for testing your knowledge, plus, a complete list of Contact Volunteer Examiners, the FCC Rules and Regulations for Ham Radio and a certificate for a free issue of *The Amateur Radio Communicator!* The NARA Educational Package is just $29.95 (3.00 S&H).



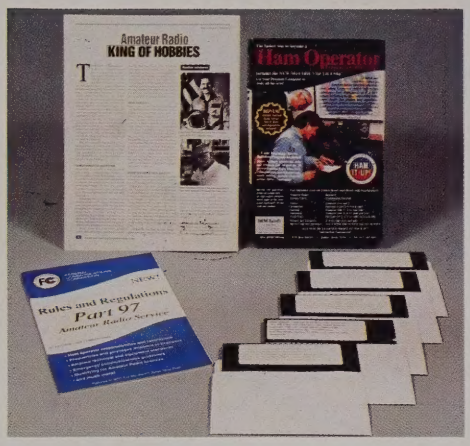
The FCC Question Pools

Each booklet contains all the questions and answers for each license class. Does not contain any explanations. Order by license class $3.00 each ($1.00 S&H) or order the Novice and Technician together (all the questions for the new code-free Technician class license) for $4.95 ($1.50 S&H).



The Ham Radio Handbook

The leading book for anyone wishing to earn the new code-free Technician license. Includes every question you might be asked during a test session, plus the four multiple choice answers. *The Ham Radio Handbook* is the only test manual that explains in detail why the correct answer is correct. Includes simple and easy-to-understand theory along with many photos and drawings. The book divides the test questions by subelement, devoting a chapter to each. The appropriate test questions and answers are given at the end of each chapter. The list of correct answers is included at the end of the book. Guaranteed to provide all the information needed to get your ham radio license. *The Ham Radio Handbook* is only $9.95 ($2.00 S&H).

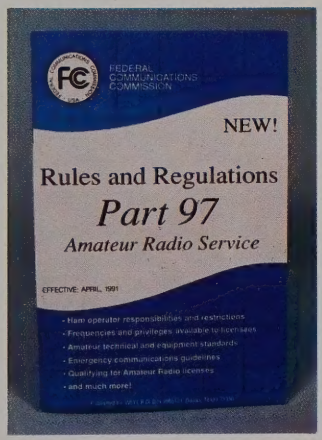


Taking a Ham Radio Test?

This amazing collection includes self-testing programs for every license class. Study all 1,931 questions by license class and supplement. The software covers the Novice, Technician, General, Advanced, and Amateur Extra on four separate disks. Each disk includes every possible test question and four multiple choice answers for each one. You can take sample ham tests right at your IBM compatible keyboard by selecting the correct answer or print out tests just like you will be given during a testing session. Prompts you if the answer is incorrect and tabulates your score both in numbers and percentage correct. This is the definitive work for anyone wanting to go "all the way." The Education Package includes a copy of Part 97 of the Rules and Regulations, and a certificate for a sample issue of *The Amateur Radio Communicator.* The Education Package is only $29.95 ($3.00 S&H).

Have Trouble with Code?

The Morse Academy software actually teaches all 43 required code characters and then steps you up through the Amateur Extra 20-wpm level using sophisticated computer aided in-struction techniques. Adjustable tone, standard or Farnsworth spacing. Sends text or random generated characters—even properly constructed code exams. Many features—plus a 40-page on-disk manual! $14.95 ($1.50 S&H).



The Rules of the Road

It took the Federal Communications Commission nearly two years to completely overhaul the Amateur Radio Service Rules to reflect current technology and Amateur operations. The FCC also deleted many unnecessary, obsolete, and redundant rule provisions.

The new rules have now been totally reorganized and revised into Part 97 of Title 47 CFR (Code of Federal Regulations) which covers all rules and regulations governing the Amateur Radio Service. This booklet includes ham operator responsibilities and restrictions, plus the frequencies and privileges available to licensees. Also covered are Amateur technical and equipment standards, emergency communication guidelines, and how to qualify for an Amateur Radio license. Over 60 pages of information—a must for every Amateur to have in the ham shack. This booklet is priced at $4.95 ($1.00 S&H).

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- Amateurs who are now, or want to become, ham radio instructors
- VE's (volunteer license examiners) who administer the Amateur Radio exams
- Amateurs concerned about the future of the Amateur Radio Service

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Here's What You'll Find in the *Communicator!*

Each month, the *Communicator* will include clear and informative articles on topics such as:

- Passing the Amateur Technician Class exam
- Erecting your first antenna
- Different types of Amateur communications
- Getting materials for your radio classes
- Classroom demonstration techniques
- Obtaining commercial support for your classes
- Keeping your students motivated
- Publicizing your Amateur Radio class
- The latest details on rules and regulations
- Up-to-date information on the VE program
- The latest news on proposed changes to the Amateur Radio Service
- Repercussions that regulation changes will have on the future of Amateur Radio

NARA publishes the only non-commercial ham magazine that addresses these subjects in a simple-to-understand manner.

What's NARA Doing?

The goals of NARA are to:

- Get more people licensed in the Amateur Service.
- Save the various Amateur bands (frequency ranges) from confiscation by commercial interests.

In the past year, Amateur Radio has lost part of the 220-MHz band and, in some areas of the country, is in the process of *losing access* to another band (900 MHz).

NARA is striving to get more people involved in the Amateur Service so we can increase activity and retain our remaining Amateur bands.

When you join NARA, your membership dollars will be used to ***further these goals***. Let's face it—with a subscription cost of only $10.00 per year, ***you won't find a better value in Amateur Radio!!*** Join today! It's easy. Just complete the subscription form below and mail your check or money order. For the fastest service, call 1-800-GOT-2-HAM (1-800-468-2426) with your Visa or MasterCard number.

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